

Vita

Candidate's name: Gaganpreet Kaur Gill

Universities

Attended: MacEwan University (2021)
Bachelors of Science

University of New Brunswick (2025)
Masters of Science
Biology

Conference Presentations:

Gill GK. and Durnford DG. 2024. Phenotypic heterogeneity in a batch culture of *Chlamydomonas reinhardtii* with different light tolerances. Canadian Society of Plant Biologists (CSPB) Eastern Regional Meeting, online Microsoft Teams platform (Oral Presentation).

Gill GK. and Durnford DG. 2024. Cellular heterogeneity of *Chlamydomonas reinhardtii* in batch culture. The Annual Conference of the Biological Sciences (COBS) at the University of New Brunswick, Fredericton, New Brunswick, Canada (Poster Presentation).

Gill GK. and Durnford DG. 2024. Heterogeneity of *Chlamydomonas reinhardtii* batch cultures. The 62nd Annual Northeastern Algal Symposium (NEAS), Middletown, Rhode Island, U.S.A. (Oral Presentation).

Gill GK. and Durnford DG. 2024. Heterogeneity of *Chlamydomonas reinhardtii* batch cultures. The 30th Annual Graduate Research Conference (GRC) at the University of New Brunswick, Fredericton, New Brunswick, Canada (Oral Presentation).

Gill GK. and Durnford DG. 2023. Cellular heterogeneity of *Chlamydomonas reinhardtii* in batch culture. Canadian Society of Plant Biologists (CSPB) Annual Meeting, Quebec City, Quebec, Canada (Poster Presentation).

Phenotypic heterogeneity in a batch culture of *Chlamydomonas reinhardtii* with different light tolerances

UNIVERSITY OF NEW BRUNSWICK

THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of
Master of Science

by

Gaganpreet K. Gill

in the Department of Biology

U.N.B., Fredericton, N.B.

**Wednesday, April 23rd, 2025
9:30 a.m.**

Bailey Hall, Room 102

Examining Committee

Dr. Dion Durnford
Dr. Janice Lawrence
Dr. Allison Enright
Dr. Adrian Reyes-Prieto

Supervisor
Internal Examiner
External Examiner
Chair of Oral Examination

Abstract

Phenotypic diversity is expected in natural microbial populations of genetically diverse individuals. However, phenotypic variation has also been observed in isogenic cultures. Using Percoll density gradients, I isolated two subpopulations of *Chlamydomonas* from two-day old batch cultures. The least dense subpopulation made up 86% of the culture; cells were larger, had greater growth, respiration, and photosynthetic rates, and greater chlorophyll and protein content per cell. Although the denser population comprised only 14% of the population and cells were not as metabolically active, it showed a greater capacity for dissipating excess light energy, was more tolerant of high-light stress, and had a greater resistance to accumulation of reactive oxygen species, suggesting a more global activation of light-stress pathways. The presence of these phenotypic variants may be part of a “bet hedging” strategy, where distinct gene expression profiles in a population gives a selective advantage under different environmental conditions.